CAREC
Central Asia Regional Economic Cooperation Program

ASIA-PACIFIC ROAD SAFETY OBSERVATORY

Road Crash Data Review and Reporting

Training on improvement to crash data management

Istanbul - 25-27 June 2024

DATA ANALYSIS, CONTRIBUTING FACTORS IDENTIFICATION

Antonino Tripodi

Road Crash Data Management Expert

FRED Engineering

Data systems importance

- Assessing comprehensively road safety performance

Describing the size and nature of the problem

Identifying priority areas

Monitoring programmes and policies

Understanding progress

Predicting future developments

INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

Using road safety data

- Wide variety of uses for data, with many different users
- Although summary data (e. g. number of crashes, number of deaths, etc.) are available in most countries, more detailed information is required to meet the requirements of these users
- Without this data collection, it is not possible to adopt a factual approach to road safety management

Decision makers

Traffic engineers

Health sector

Research community

Insurance companies

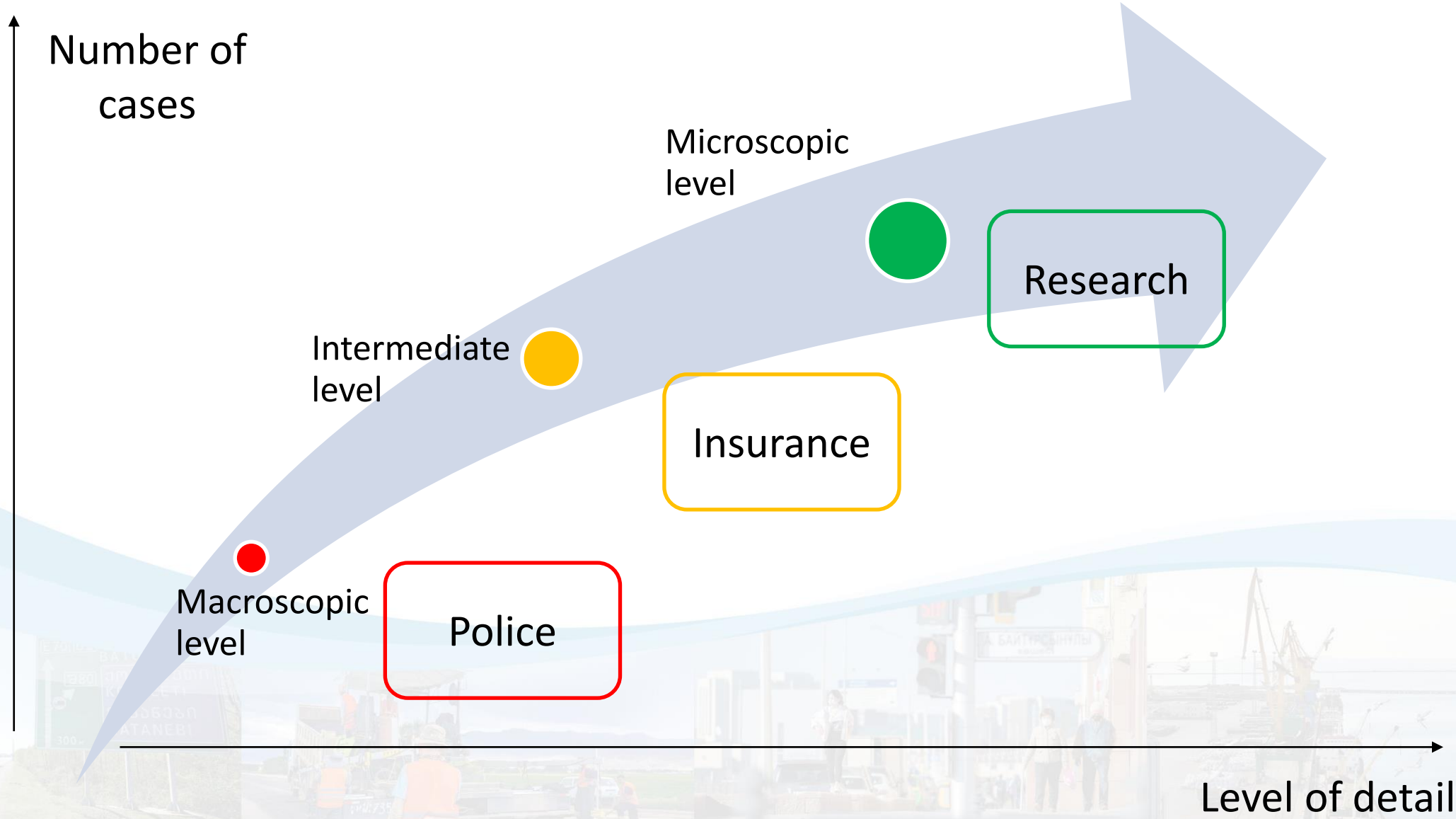
Prosecutors

Vehicle manufacturers

Etc.

INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

Macroscopic vs microscopic data



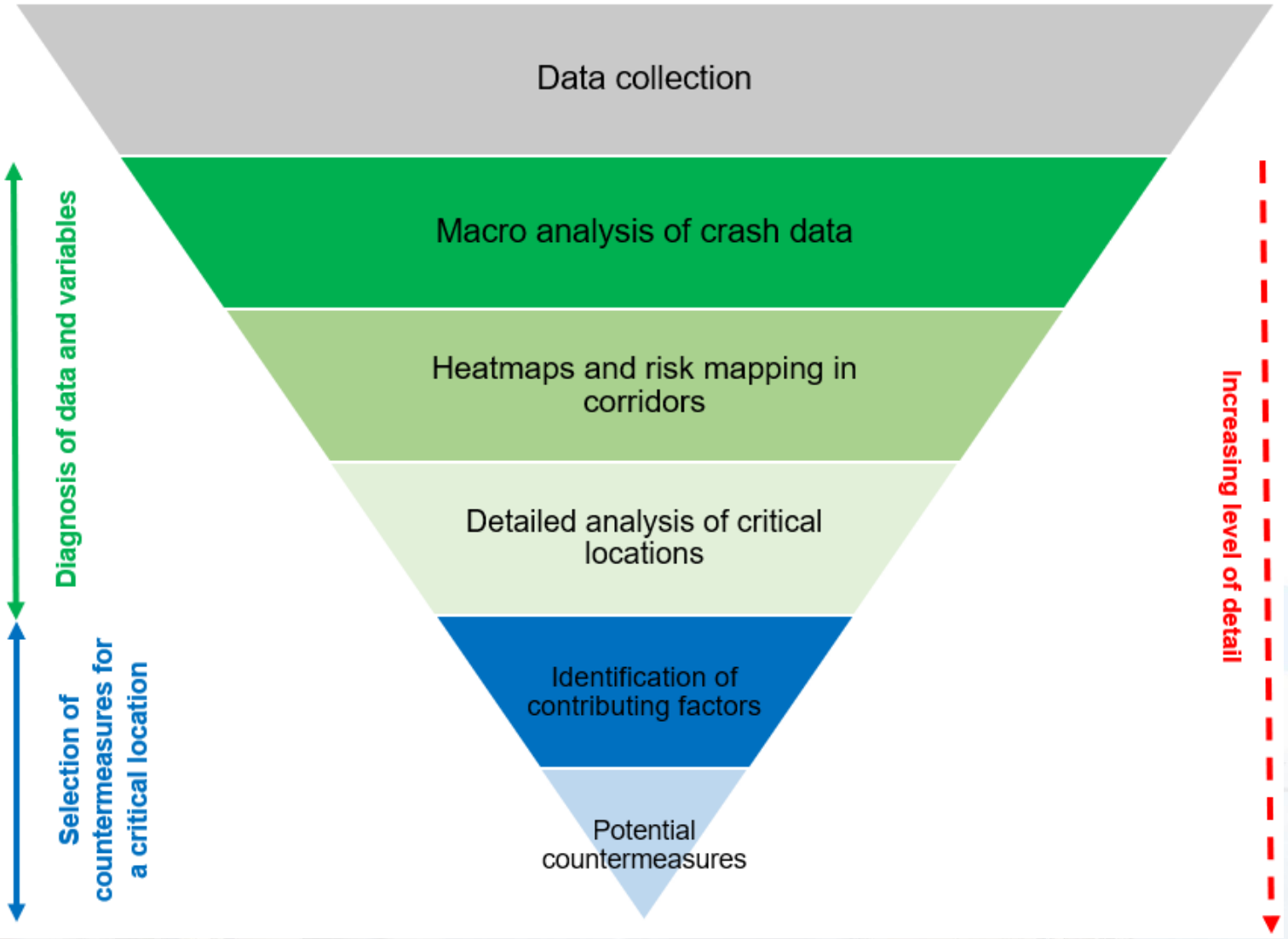
INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

Macroscopic vs microscopic data

- Macroscopic data is mainly established by police services
  - ~50-100 variables
  - To obtain national statistics, monitor crash trends, identify high-risk sections
- Microscopic data is far more detailed
  - More than 500 variables
  - Collected by research institutes, hospitals, insurance companies, …
  - For active and passive vehicle safety system development, road infrastructure improvements and policy making

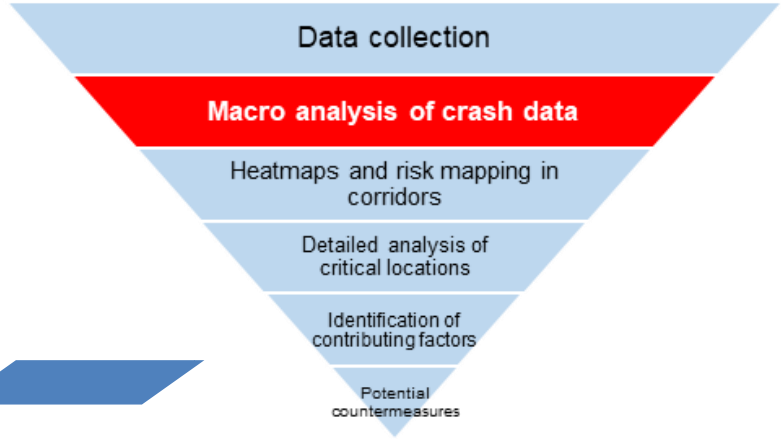
INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

Data analysis process



INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

Macro analysis of crash data



National/territorial trends

Territorial comparisons

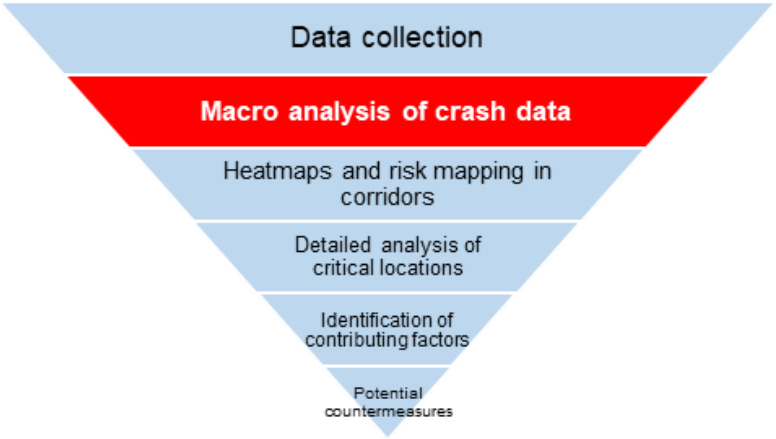
Statistics by mode

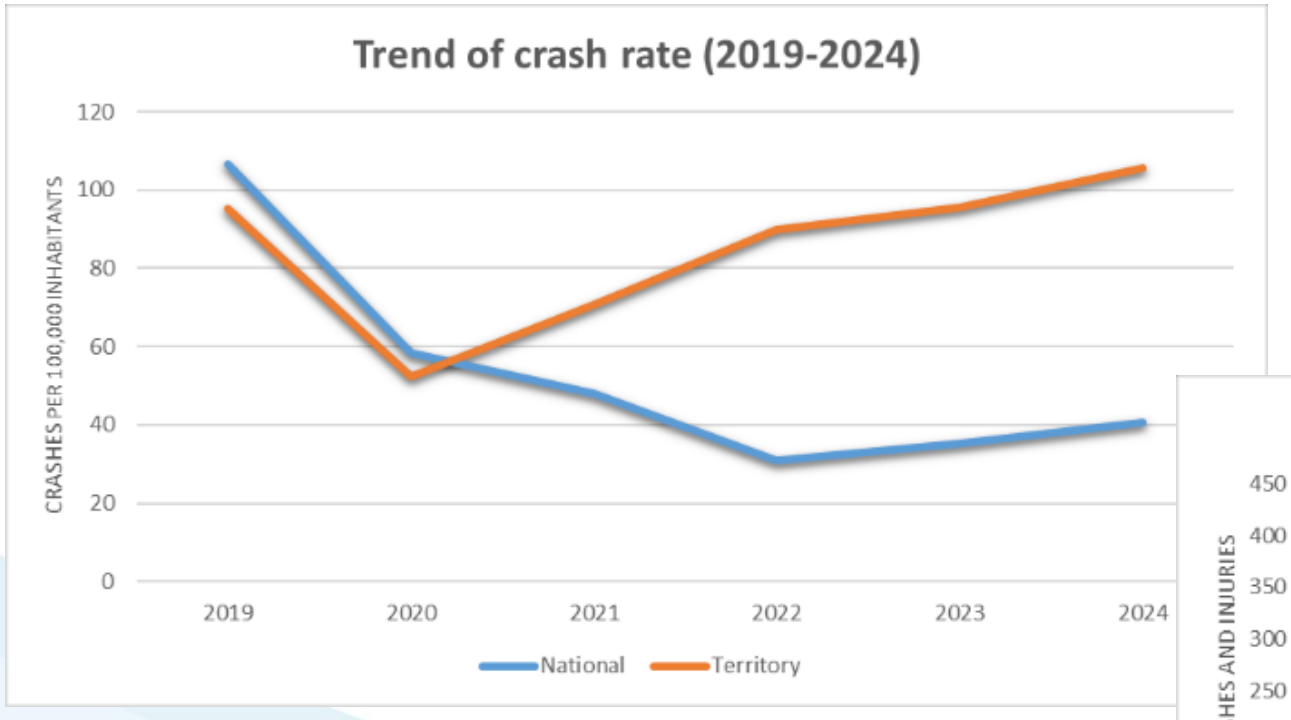
Trends in the statistics

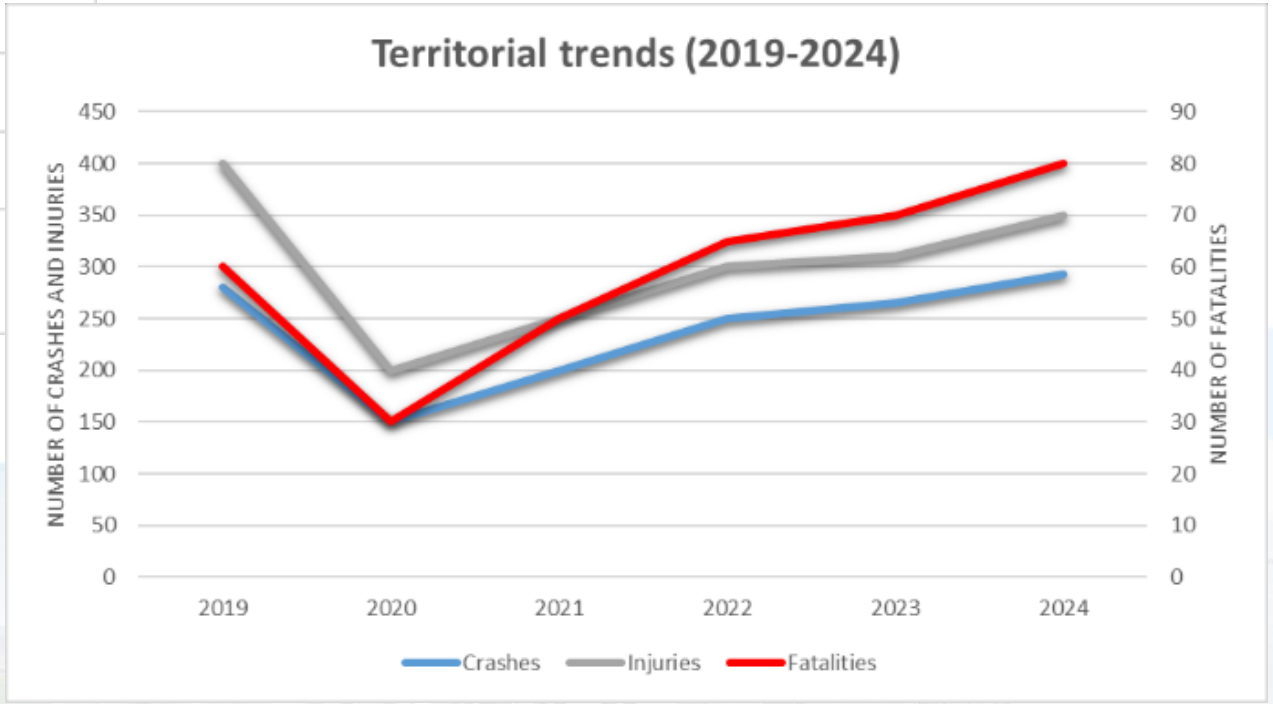
Road crashes by type, age, gender, time period, etc.

INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

National/territorial trends

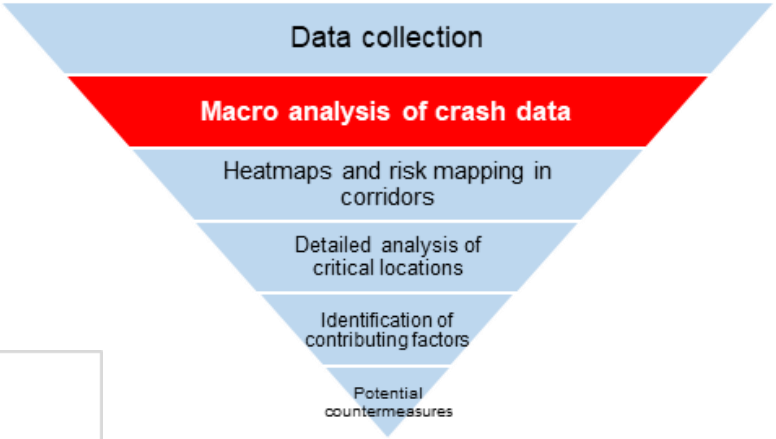


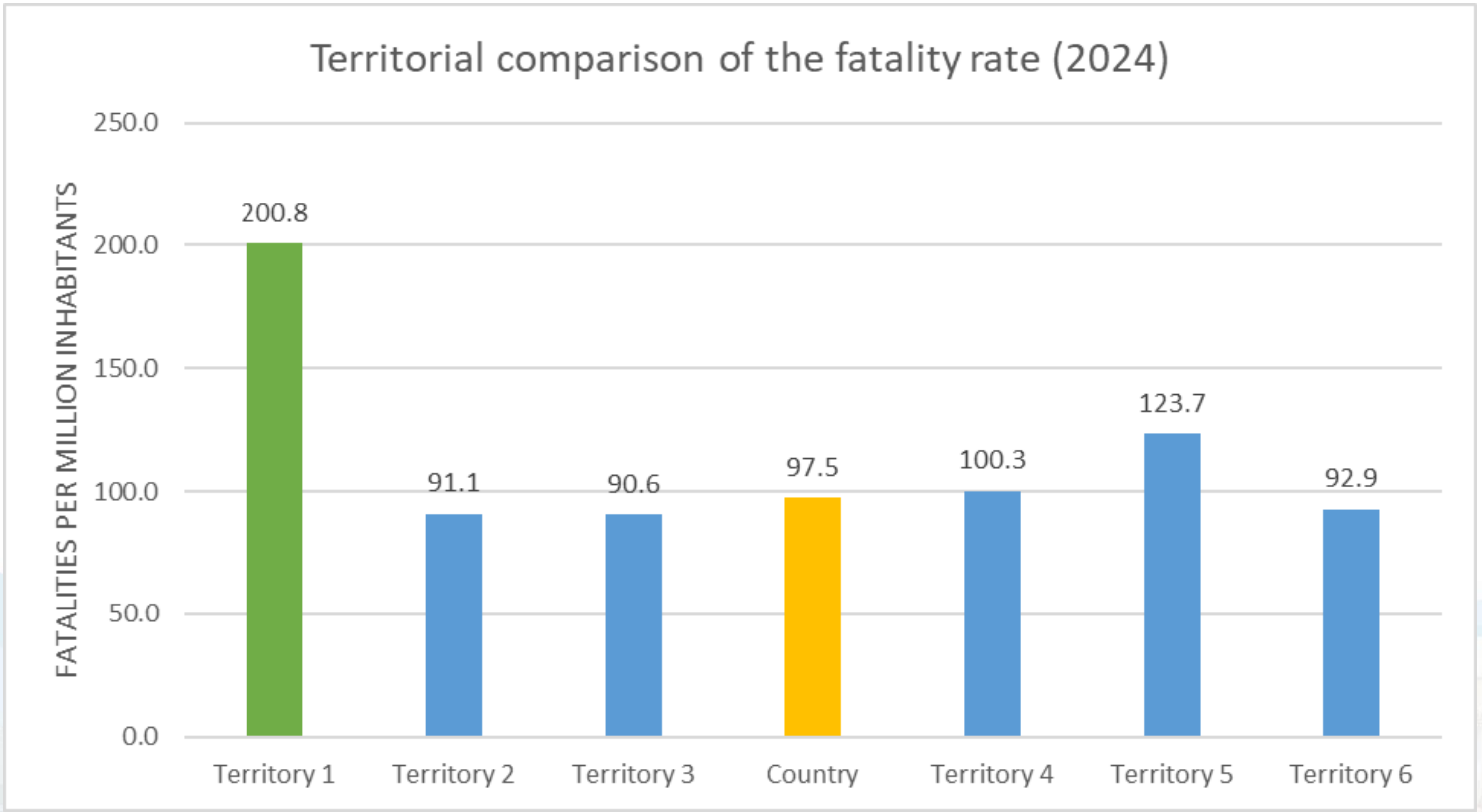




INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

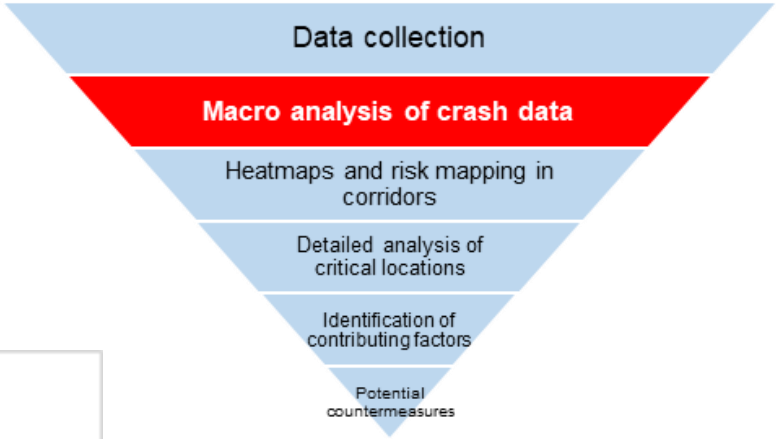
Territorial comparison

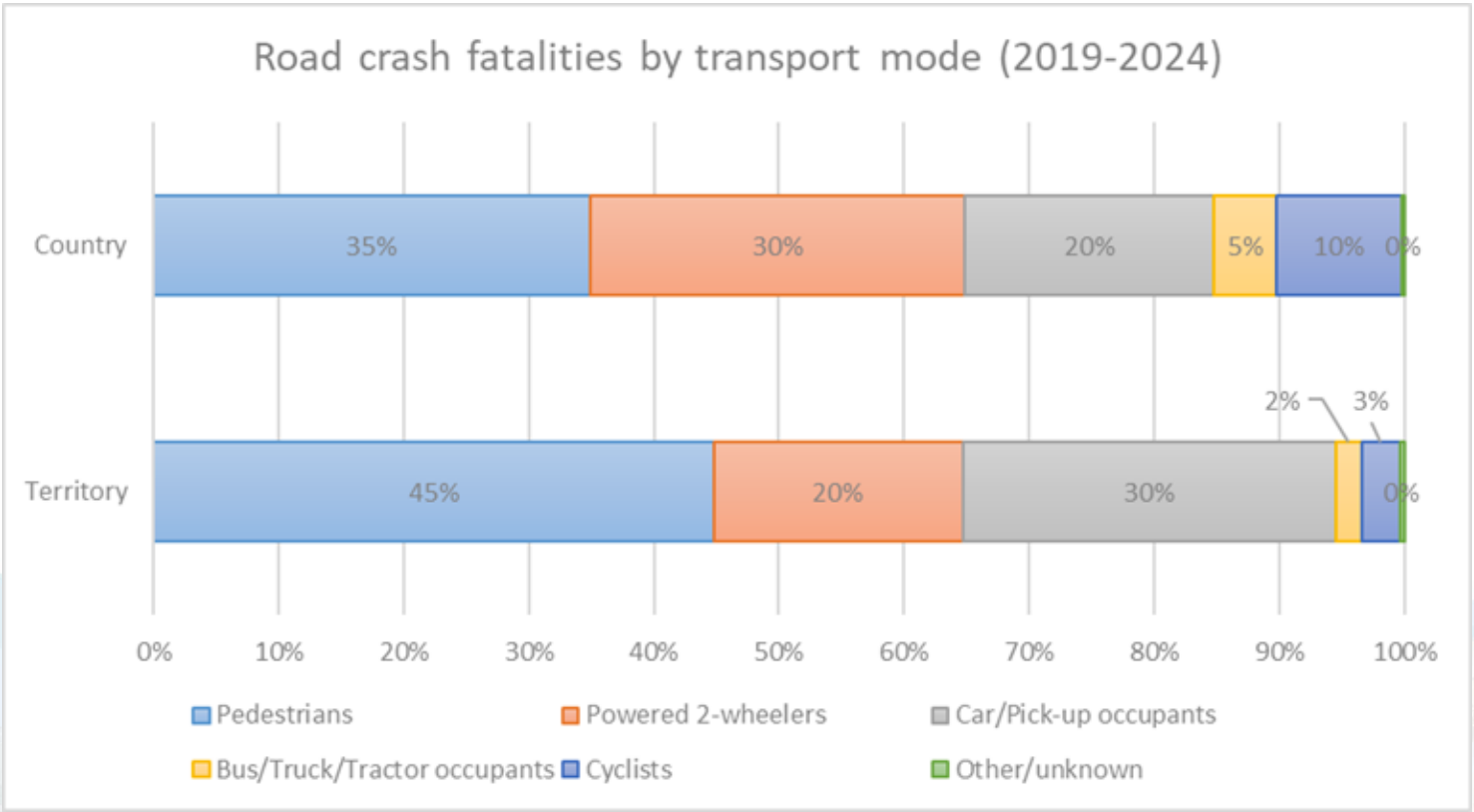




INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

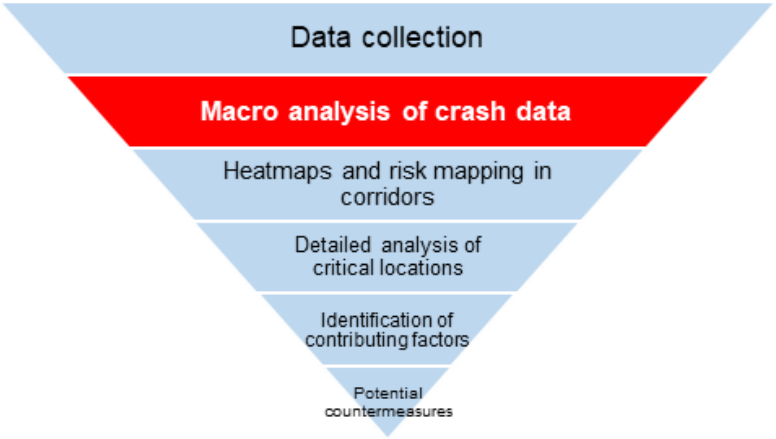
Statistics by mode

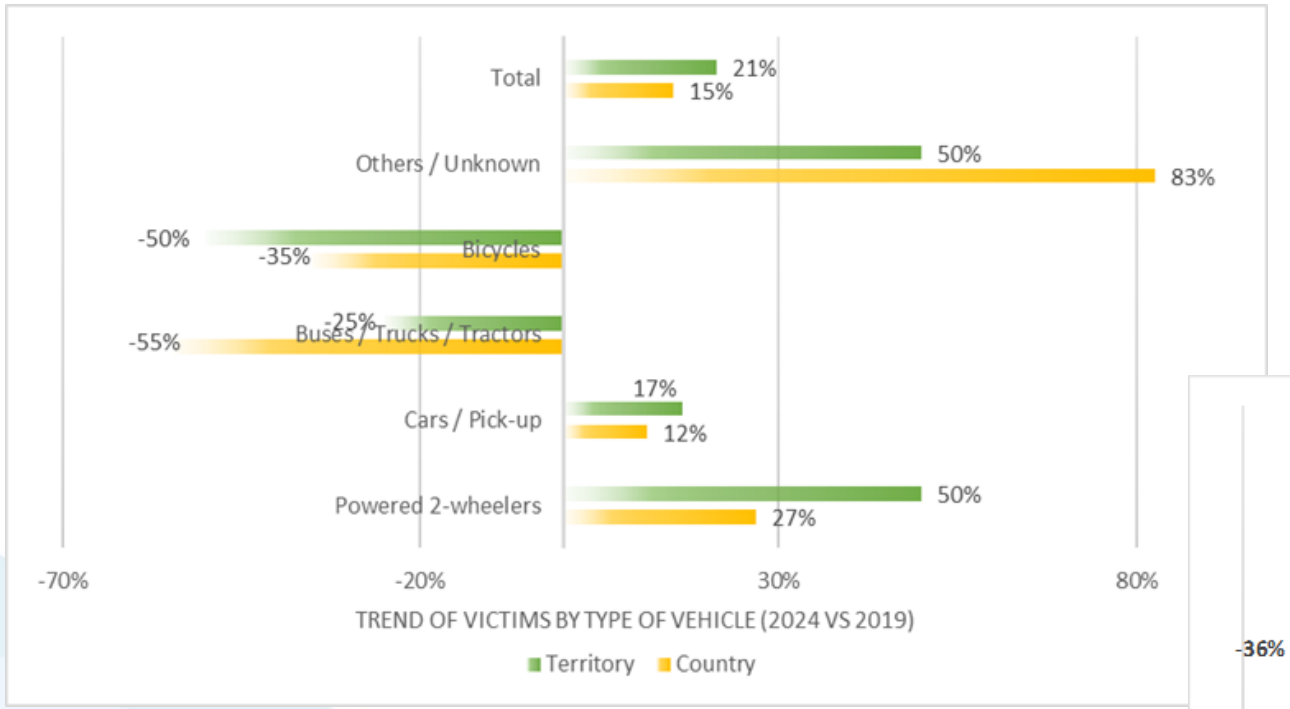


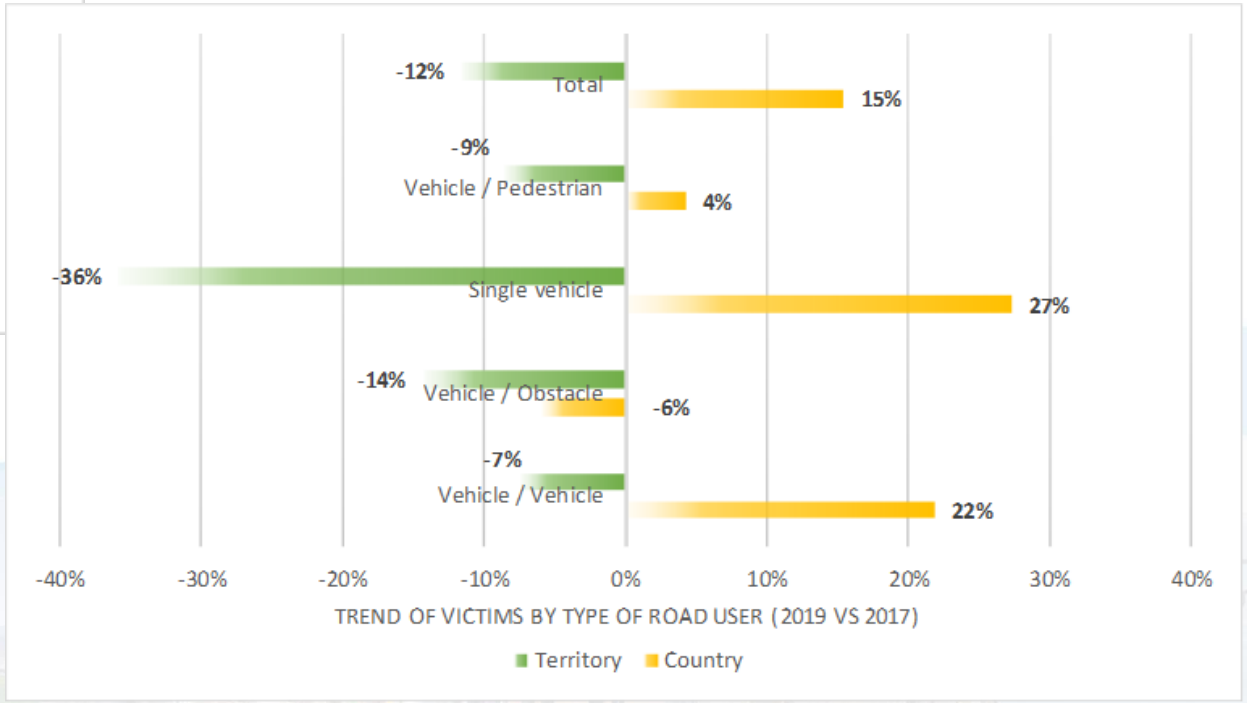


INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

Trends in statistics

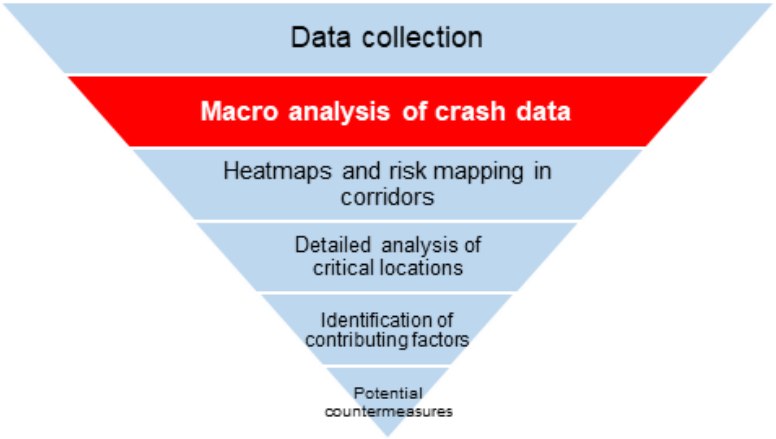


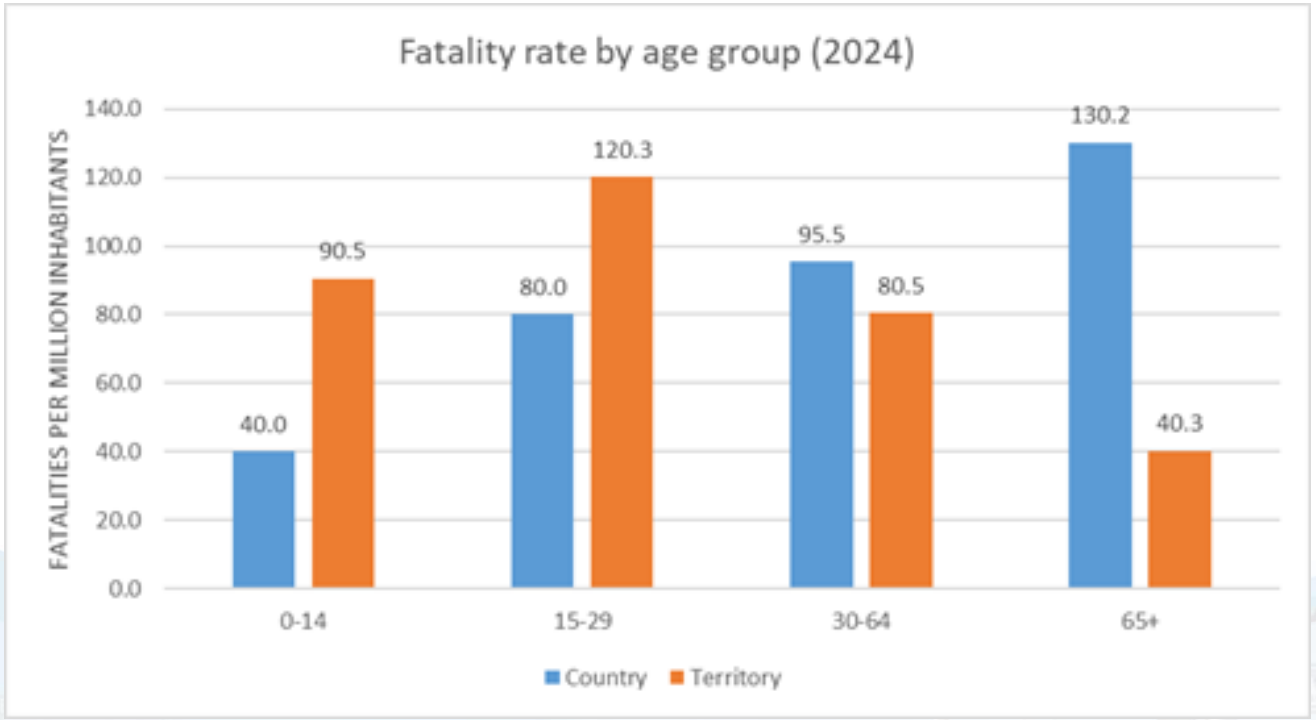




INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

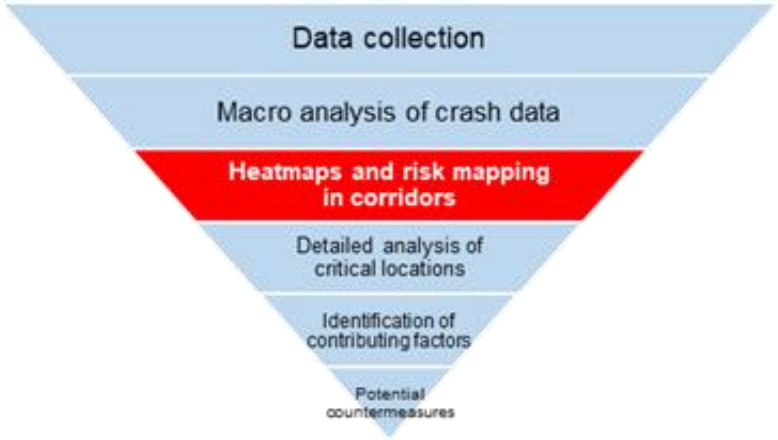
Statistics by age





INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

Heatmaps and risk mapping in corridors

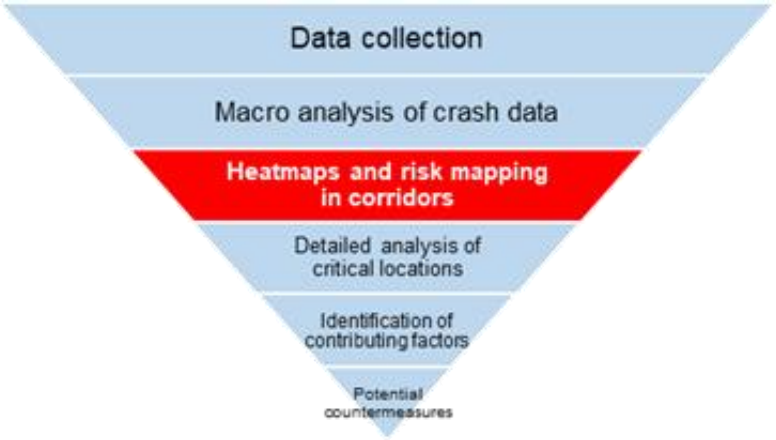


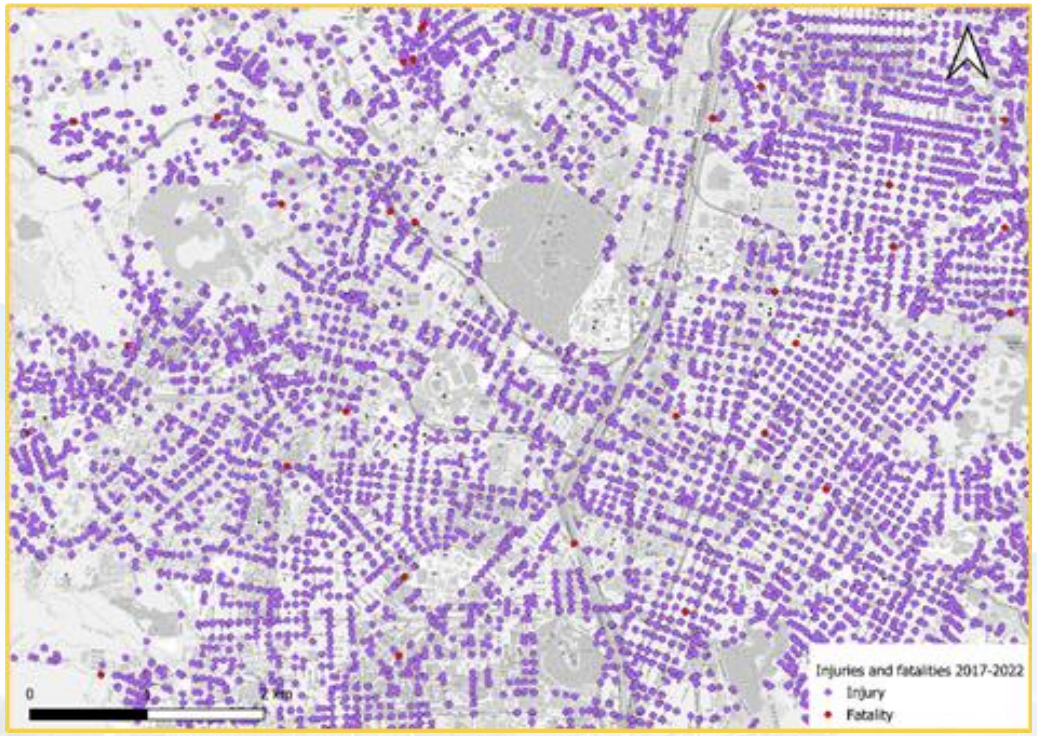
Heatmaps for finding critical intersections

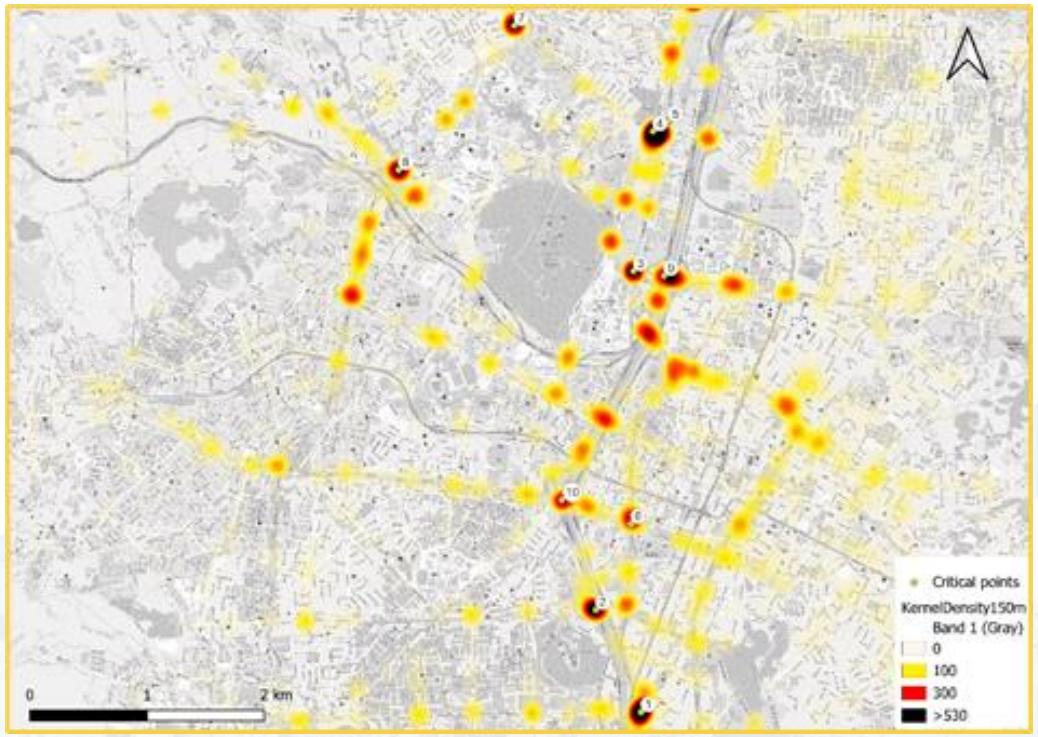
Risk mapping for finding critical road sections

INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

Heatmaps

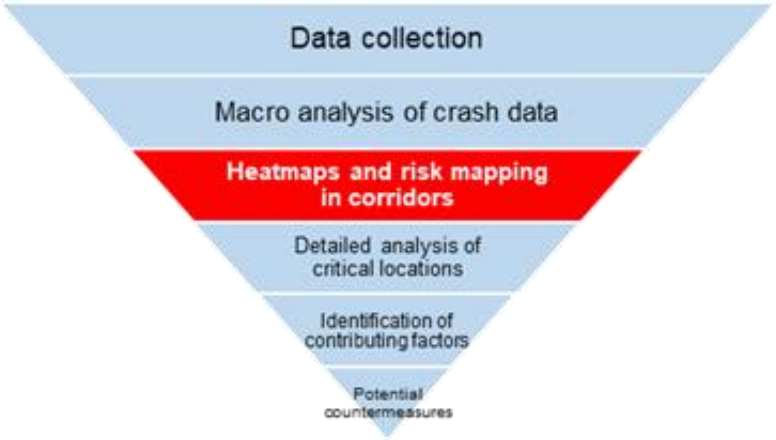


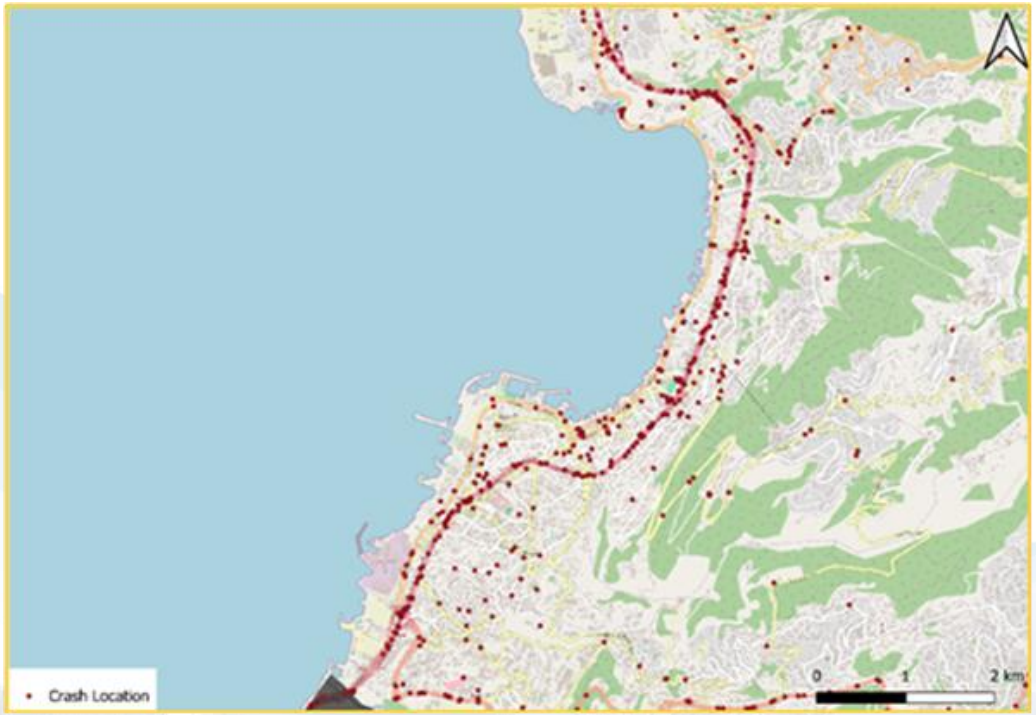




INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

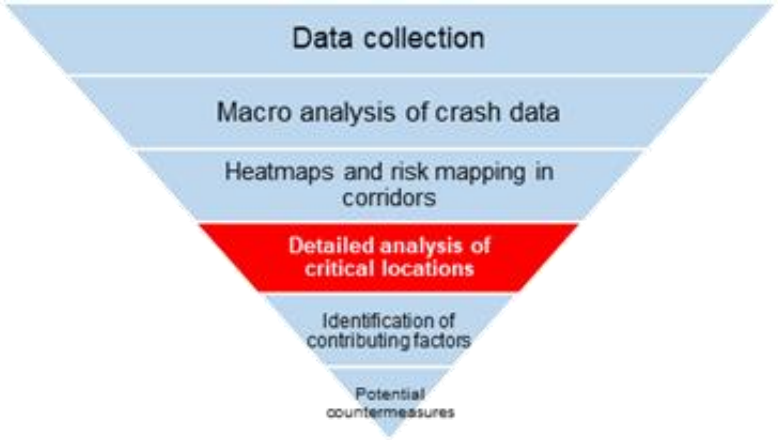
Risk mapping





INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

Detailed analysis of critical locations



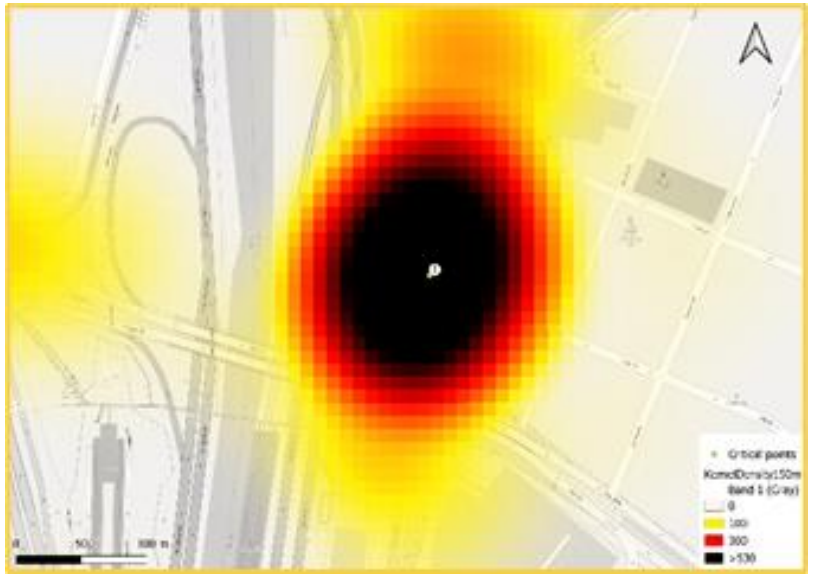
Crashes by time of the day, weather conditions, light conditions, surface condition, etc.

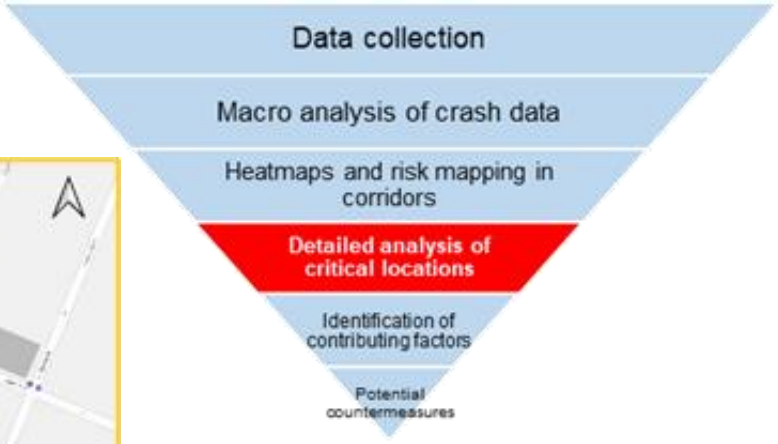
Distribution of injuries and fatalities

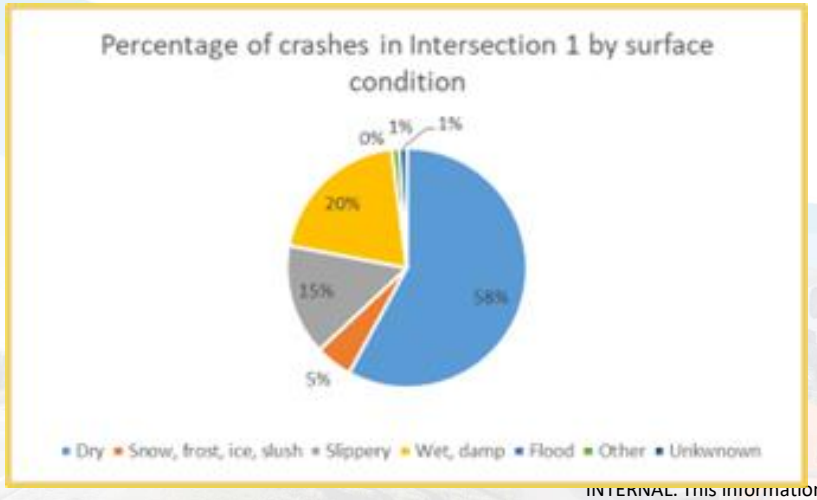
Victims by road user type

INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

Example for intersections



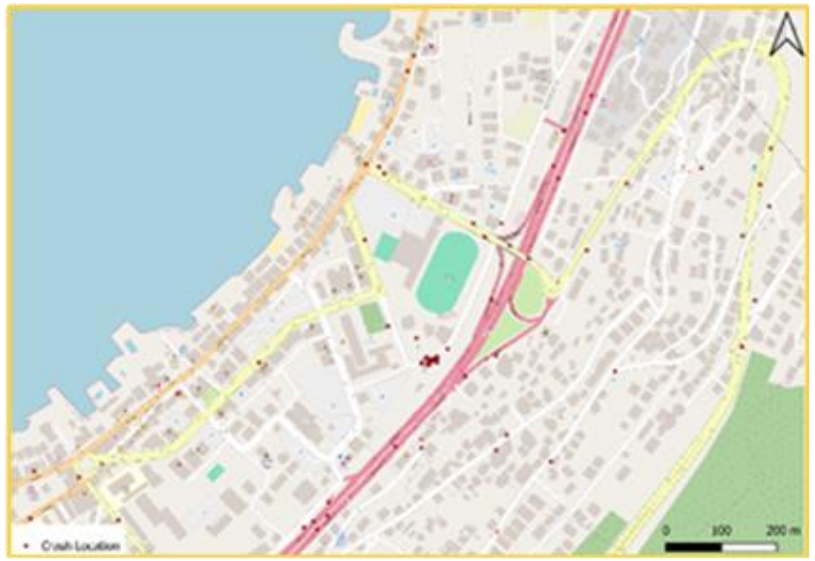


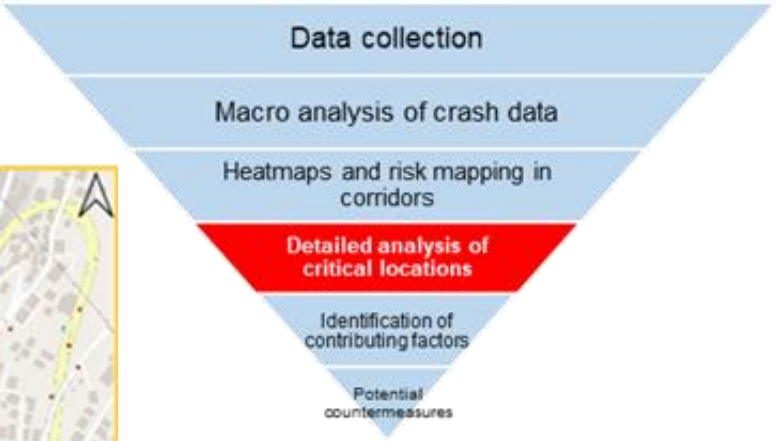


Crash ID	Year	Lat	Long	Severity	Surface condition	…
1001	2021	X1	Y1	Injury	Dry	…
1002	2022	X2	Y2	Fatality	Dry	…
1003	2024	X3	Y3	Injury	Slippery	…
1004	2022	X4	Y4	Injury	Dry	…
1005	2019	X5	Y5	Fatality	Slippery	…
1006	2021	X6	Y6	Injury	Wet, damp	…
1007	2021	X7	Y7	Injury	Dry	…
1009	2023	X8	Y8	Fatality	Wet, damp	…
…	…	…	…	…	…	…

INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

Example for intersections

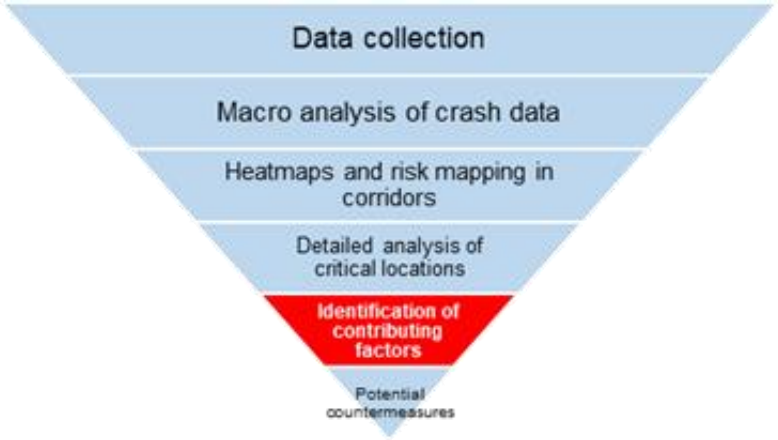




Crash ID	Year	Lat	Long	Fat.	Inj.	Road user type	...
1001	2024	X1	Y1	1	2	Driver	...
1002	2024	X2	Y2	0	0	Passenger	...
1003	2023	X3	Y3	0	1	Pedestrian	...
1004	2022	X4	Y4	2	1	Passenger	...
1005	2019	X5	Y5	0	0	Passenger	...
1006	2021	X6	Y6	0	2	Pedestrian	...
1007	2024	X7	Y7	1	3	Driver	...
1009	2023	X8	Y8	3	4	Pedestrian	...
...	...	...	...	...	...	...	...

INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

Identification of contributing factors

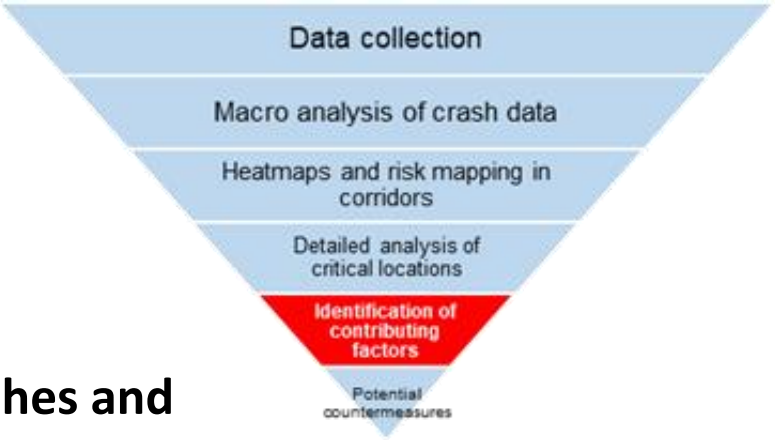


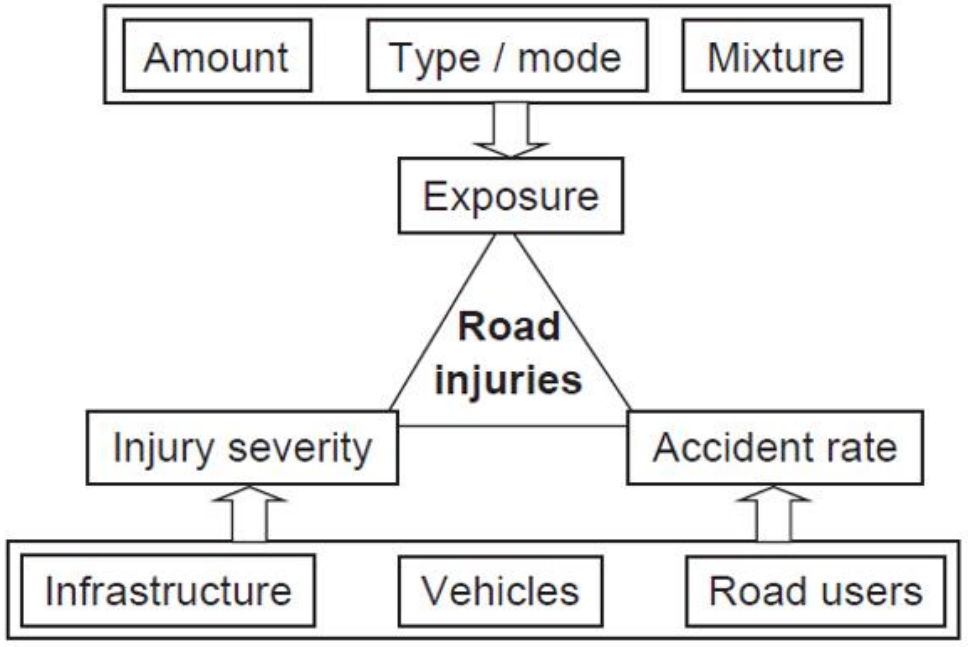
Main contributing factors: exposure, crash rate, injury severity

Haddon matrix

INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

Factors affecting road safety





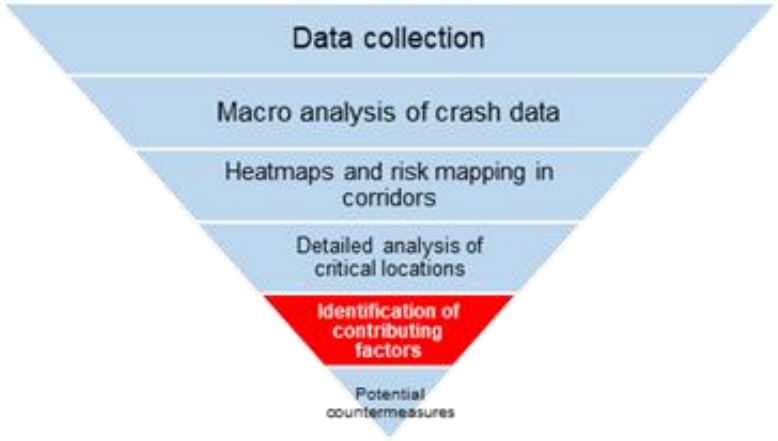
How to reduce crashes and casualties?

- Decreasing the amount of travel
- Shifting travel to transportation modes with lower levels of risk
- Reducing crash rate for a given amount of travel
- Protecting individuals from injuries

INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

How to identify contributing factors?

For instance, using methodologies like the Haddon Matrix

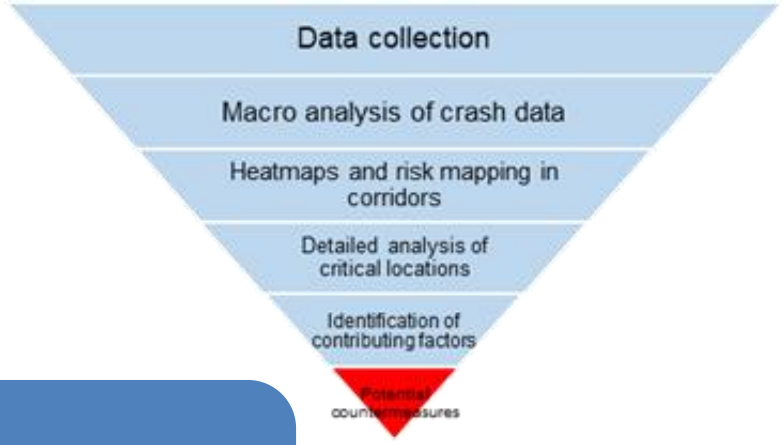


- Link main factors affecting road crashes (persons / vehicles / road conditions) with periodicity (before / during / after the crash)

Period	Human factors	Vehicle factors	Road factors
Before the crash (causes of the hazardous situation)	cell phone use, alcohol drinking, distraction	lack of vehicle maintenance, bald tires, worn brakes	inadequate lane width, inadequate roadway shoulders, inadequate maintenance, poor visibility
During the crash (causes of crash severity)	failure to wear a seat belt, failure to wear PPEs, vulnerability to injury, age	type of vehicle, bumper heights and energy absorption, headrest design, airbag operations	grade, pavement friction
After the crash (factors of crash outcome)	age, gender	ease of removal of injured passengers	emergency services response time, subsequent post-crash care

INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

Selection of interventions



1. Identify contributing factors

2. Potential interventions that could mitigate these factors

3. Perform an economic appraisal

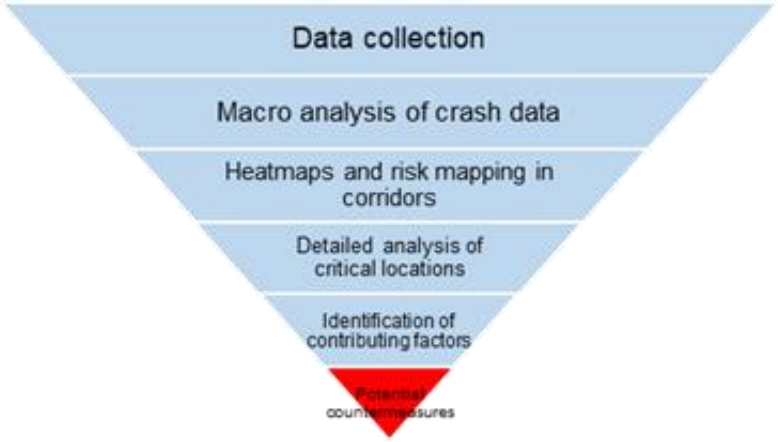
- Good practices
- Toolkits
- Experience

- Net present value
- Benefit Cost Ration
- Cost-effectiveness analysis

Crash Modification Factors

INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.

Selection of interventions



Interventions chosen based on contributing factors

INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.